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History of premenstrual syndrome and development of postpartum depression: a systematic review and meta-analysis

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Abstract

Background Premenstrual syndrome (PMS) is thought to be a risk factor for postpartum depression (PPD), but results from studies examining the association have been mixed.

Objectives To estimate the association between pre-pregnancy history of PMS and development of PPD and evaluate the risk of bias of included evidence.

Search strategy PubMed, EMBASE, CINAHL, PsycINFO, Cochrane Library, CNKI, Wanfang Data, and reference lists of relevant papers were searched.

Selection criteria Observational studies that collected pre-pregnancy history of PMS and measured PPD status between one week and one year after delivery were included.

Data collection and analysis This study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Random-effect models were used to calculate pooled odds ratios (ORs) with 95% confidence interval (CI). Small study effect was analysed by funnel plot. Risk of bias was assessed using the Risk of Bias Instrument for Non-Randomized Studies of Exposures (ROBINS-E).

Main results Our meta-analysis included 19 studies. Overall, women with a pre-pregnancy history of PMS had more than double the odds of PPD compared to those without PMS (OR: 2.20, 95% CI: 1.81-2.68). However, the quality of evidence was low: five studies had moderate risk, eleven studies had serious risk, and three studies had critical risk of bias.

Conclusions Current evidence supports a significant association between history of PMS and development of PPD. Well-designed prospective studies are needed to further investigate this relationship.

Keywords Meta-analysis, premenstrual syndrome (PMS), core premenstrual disorders (PMDs), postpartum depression (PPD), risk factor, prevention

Introduction

Postpartum depression (PPD) is one of the most common complications of childbearing (Stewart and Vigod, 2016) that occurs within one year after childbirth, and affects about 13 to 19% of women worldwide (O'Hara and McCabe, 2013). It has deleterious effects on both mothers and children if left untreated (Da Costa et al., 2006; Murray et al., 2003). Suicide and infanticide are the most severe consequences (Esscher et al., 2016; Lindahl et al., 2005; Wisner et al., 2013) and several other negative outcomes are also related to PPD, such as impairment of both mother-infant attachment and emotional development in children (Stein et al., 2014). It is important, therefore, to identify women at risk of PPD as early as possible.

Psychosocial factors, previous history of depression and lack of social support are the strongest known predictors for PPD (Ghaedrahmati et al., 2017; O'Hara and Swain, 1996). Premenstrual syndrome (PMS) has been recently recognised as a potential risk factor of PPD (Buttner et al., 2013; Maliszewska et al., 2017; Turkcapar et al., 2015), however whether having a history of PMS increases the risk for PPD remains unclear and inconsistent findings have been reported. For example, Sylvén and colleagues reported that women with a history of PMS before pregnancy had three times higher odds of PPD at six weeks postpartum, compared to those without such a history (odds ratio (OR), 95% confidence interval (CI): 3.35, 1.72-6.51) (Sylvén et al., 2013); while, Martini et al. found that pre-pregnancy PMS was not associated with PPD (OR, 95%CI: 1.74, 0.55-5.47) (Martini et al., 2015). This lack of evidence for an association reported in the latter study may reflect insufficient statistical power, a limitation that could be addressed by conducting an appropriate meta-analysis of available results.

In their recently-published systematic review, Amiel Castro et al. (Amiel Castro et al., 2018) concluded that the evidence supports an association of PMS with increased risk of PPD;

however they did not consider the temporal relationship between PMS and PPD when selecting studies for inclusion. As a result, studies that examined the effect of PPD on PMS development after delivery (Haywood et al., 2007; Warner et al., 1991) and studies examining the comorbidity between PMS and PPD (Kim et al., 2016; Yang et al., 2015) were included along with studies investigating the association between history of PMS and development of PPD. Moreover, their review did not include a meta-analysis to estimate the overall magnitude of the association to compare with previous findings in the literature (Bloch et al., 2005; Kara et al., 2008). A synthesis of evidence is still lacking, therefore, that specifically focuses on the history of PMS and the development of PPD and that provides an analysis of pooled results from different studies (Dwyer et al., 2001; Thompson, 1994).

The classification of PMS is a potential issue that could lead to inconsistent findings in studies assessing prevalence or associations. PMS has multiple definitions that differ in terms of timing, type, and severity of symptoms (Yonkers and Simoni, 2018). For example, the World Health Organization (WHO)'s International Statistical Classification of Diseases and Related Health Problems Tenth edition (ICD-10) includes "premenstrual tension syndrome", which refers to any premenstrual symptoms such as tension or migraine without consideration of the type or severity of the symptoms (Pearlstein, 2007a). This definition serves as the most relaxed criteria of PMS, corresponding to a prevalence up to 80 to 90% (Pal et al., 2011; Raval et al., 2016; Tolossa and Bekele, 2014). In contrast, the American College of Obstetricians and Gynecologists (ACOG) definition of PMS (American College of Obstetricians and Gynecologists, 2000) and the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition (DSM-IV) definition for a severe form of PMS – premenstrual dysphoric disorder (PMDD) (American Psychiatric Association, 1994) – both specify the physical and psychological symptoms that must be present and require that symptoms are sufficiently severe to impair a woman's daily life. These two definitions across the degree of

PMS have a prevalence of 40% and 3-8%, respectively (Pearlstein, 2007b). More recently, the International Society for Premenstrual Disorders (ISPMD) used core premenstrual disorders (PMDs) to define the most commonly encountered and widely recognised type of PMS, which is distinguished from physiological premenstrual symptoms. Core PMDs refer to premenstrual symptoms that significantly affect an individual's daily functioning irrespective of the type or number of symptoms (Ismaili et al., 2016; Nevatte et al., 2013; O'Brien et al., 2011). This concept has been incorporated in the 2017 version of the Royal College of Obstetricians and Gynaecologists (RCOG) PMS guideline (Royal College of Obstetricians & Gynaecologists, 2017). Similarly, the various measurements of PPD, the confounding factors, and different methods used for participants selection, may all contribute to mixed findings on the association between history of PMS and development of PPD reported across studies.

This systematic review aims to: (1) summarise current evidence for the association between a pre-pregnancy history of PMS and PPD development; (2) evaluate the risk of bias of the included studies; (3) perform a meta-analysis to estimate the magnitude of this association; and (4) provide recommendations for future studies examining the association of interest.

Methods

Protocol and registration

This review was registered with PROSPERO and the protocol ID is CRD42018080685.

Data sources and searches

In accordance with PRISMA guidelines (Moher et al., 2009), we conducted a comprehensive literature search for articles published in both English and Chinese up to 1 April 2019. The English databases searched were PubMed, EMBASE, CINAHL, PsycINFO and Cochrane library, and the Chinese databases searched were CNKI and Wanfang Data. We combined the data-specific search terms on exposure (PMS/PMDD) and outcomes (PPD) (see Appendix S1

for the detailed search strategies). Reference lists of retrieved articles were scanned for additional literature. All literature was screened in EndNote.

Study selection and eligibility criteria

One author (S.C.) screened titles and abstracts of articles retrieved from the initial search. After excluding articles based on the title and abstract only, the same author then assessed the full-text of remaining articles for eligibility based on the inclusion criteria (reported below).

PMS was defined as premenstrual symptoms that occur repeatedly in the late luteal phase, irrespective of the types or severity of the symptoms, a definition that also included PMDD as defined by the DSM-IV. PPD was defined as depression that occurs within one year after childbirth. To summarise the association between history of PMS and development of PPD, only those studies that met all the following criteria were included:

(1) Observational studies originally published in English or Chinese;

(2) Participants were recruited during pregnancy or within the first postpartum year;

(3) History of PMS was clearly defined as experience of PMS before the current pregnancy/delivery;

(4) PPD status was determined after one week of delivery, by either clinical diagnosis or screening with an exact cut-off point.

Studies that measured PPD within one week postpartum were excluded due to the high risk of including women with postpartum blues (Dennis and Ross, 2006). Studies were excluded from meta-analysis if ORs with 95% CIs or contingency table/s for the association were not provided. Excluded studies after full-text assessment are listed in Table S1.

Data extraction and risk of bias assessment

Two authors (S.C. and M.J.) independently extracted data from the original studies. Data such as study design, country, age, number of participants, and definitions of PMS and

measurements of PPD that were used, and the association between PMS and PPD were extracted.

S.C. and M.J. independently evaluated the risk of bias using the Risk of Bias Instrument for Non-Randomized Studies of Exposures (ROBINS-E) . The ROBINS-E has seven domains assessing the source of bias: confounding, selection of participants, classification of exposures, deviation from intended exposures, missing data, measurement of outcomes, and selection of the reported result. Each domain was assessed as at low, moderate, serious, or critical risk of bias, and the study was rated overall as at least the same level of severity of the highest risk of bias of an individual domain (Sterne et al., 2016). If there was serious risk of bias in two or more domains, the study was judged at overall critical risk of bias, considering the potential additive effect of multiple serious risks of bias (Sterne et al., 2016). Differences in the risk of bias assessment between authors were resolved in discussion with the senior author (G.D.M.).

Data synthesis and analysis

In the meta-analysis, ORs together with their 95% CI were used as the estimate of effect size for the association between PMS and PPD. The Q statistic was used to test the null hypothesis of no heterogeneity in OR estimates and I^2 to measure the proportion of variation in OR attributable to heterogeneity. Set a priori, random effect models were used for meta-analysis if the heterogeneity was higher than 30%.

Four subgroup analyses were conducted. These were (1) by the risk of bias; (2) by study design;

(3) by PMS definition; and (4) by PPD assessment approach. Cohort studies are better for assessing the temporal relationship between PMS and PPD and thus were grouped separately from the cross-sectional studies and case-control studies. Regarding PMS definition, both

ISPMD (Nevatte et al., 2013) and the RCOG (Royal College of Obstetricians & Gynaecologists, 2017) specify premenstrual symptoms that significantly affect individual's daily functioning irrespective of the type or number of symptoms to be the most commonly encountered and widely recognised type of PMS and thus should be termed as core PMDs. Therefore, we assessed the PMS definition in the original studies and dichotomised the included studies into two subgroups by whether they fulfilled the core PMDs criteria. The PPD status of the included studies was a mixture of clinician diagnosis and screening results, which may be another source of heterogeneity and thus, differences in effect size in these two groups of measurement were examined. Funnel plot and the trim-and-fill method were used to assess small study effects and/or publication bias.

Results

Identification of relevant studies

An electronic search identified 904 records from the various databases. An additional 14 citations were retrieved from reference lists of relevant papers. Abstracts of 642 records were screened after duplicates were removed. The full texts of 106 records closely relevant to the research topic were assessed. Of these, 19 studies meeting all inclusion criteria were synthesised in the meta-analysis, two of which were published in Chinese (Wang, 2008; Zhang, 2011) and the rest in English (Aydin et al., 2005; Bloch et al., 2005; Boyle and Boucher, 2000; Buttner et al., 2013; Garcia-Esteve et al., 2008; Kara et al., 2008; Lee et al., 2015; Limlomwongse and Liabsuetrakul, 2006; Maliszewska et al., 2017; Martini et al., 2015; McGill et al., 1995; Poçan et al., 2013; Roomruangwong et al., 2016; Saleh et al., 2012; Spangenberg and Pieters, 1991; Sylvén et al., 2013; Turkcapar et al., 2015) (Figure 1).

Study characteristics

In total, the present meta-analysis involved 8990 women from 14 countries who were recruited in the original studies with no restrictions on their previous depression history. Eighty-three percent were assessed for PPD with screening tools (Aydin et al., 2005; Boyle and Boucher, 2000; Kara et al., 2008; Lee et al., 2015; Limlomwongse and Liabsuetrakul, 2006; Maliszewska et al., 2017; McGill et al., 1995; Poçan et al., 2013; Roomruangwong et al., 2016; Spangenberg and Pieters, 1991; Sylvén et al., 2013; Turkcapar et al., 2015; Zhang, 2011) and 17% were assessed by clinical practitioners (Bloch et al., 2005; Buttner et al., 2013; Garcia-Esteve et al., 2008; Martini et al., 2015; Saleh et al., 2012; Wang, 2008). In 13 of the 19 (68%) included studies (Bloch et al., 2005; Garcia-Esteve et al., 2008; Kara et al., 2008; Lee et al., 2015; Limlomwongse and Liabsuetrakul, 2006; Maliszewska et al., 2017; Poçan et al., 2013; Roomruangwong et al., 2016; Saleh et al., 2012; Sylvén et al., 2013; Turkcapar et al., 2015; Wang, 2008; Zhang, 2011), women were assessed for PPD within 3 months after childbirth; in 5 studies (Aydin et al., 2005; Boyle and Boucher, 2000; Buttner et al., 2013; Martini et al., 2015; Spangenberg and Pieters, 1991), women were assessed for PPD heterogeneously in the first postpartum year; in one study, women were assessed for PPD in the late postpartum period, between 6 and 9 months after delivery (McGill et al., 1995). All studies retrospectively collected pre-pregnancy history of PMS. Twelve studies (Aydin et al., 2005; Boyle and Boucher, 2000; Kara et al., 2008; Limlomwongse and Liabsuetrakul, 2006; Maliszewska et al., 2017; McGill et al., 1995; Poçan et al., 2013; Roomruangwong et al., 2016; Saleh et al., 2012; Spangenberg and Pieters, 1991; Turkcapar et al., 2015; Wang, 2008) used a broad definition to define PMS without requiring impairments on women's daily life, of which seven studies (Kara et al., 2008; Limlomwongse and Liabsuetrakul, 2006; McGill et al., 1995; Poçan et al., 2013; Saleh et al., 2012; Spangenberg and Pieters, 1991; Turkcapar et al., 2015) specified only psychological symptoms to fulfil a

definition of PMS; two studies (Maliszewska et al., 2017; Roomruangwong et al., 2016) specified both physical and psychological symptoms; three studies (Aydin et al., 2005; Boyle and Boucher, 2000; Wang, 2008) required either physical or psychological symptoms to define PMS. The remaining seven studies (Bloch et al., 2005; Buttner et al., 2013; Garcia-Esteve et al., 2008; Lee et al., 2015; Martini et al., 2015; Sylvén et al., 2013; Zhang, 2011) required the symptoms to be severe enough to impair women's daily life, thus satisfying the definition of core PMDs. All 19 included studies examined the association between previous mental disorder and PPD, of which 12 studies specifically evaluated the relationship between a history of depression and PPD (Bloch et al., 2005; Boyle and Boucher, 2000; Buttner et al., 2013; Garcia-Esteve et al., 2008; Kara et al., 2008; Martini et al., 2015; McGill et al., 1995; Roomruangwong et al., 2016; Spangenberg and Pieters, 1991; Turkcapar et al., 2015; Wang, 2008; Zhang, 2011) (Table 1).

Risk of bias assessment

Serious risk of bias was found for confounding in 12 studies (Bloch et al., 2005; Boyle and Boucher, 2000; Lee et al., 2015; Martini et al., 2015; McGill et al., 1995; Poçan et al., 2013; Roomruangwong et al., 2016; Saleh et al., 2012; Spangenberg and Pieters, 1991; Turkcapar et al., 2015; Wang, 2008; Zhang, 2011), selection of participants in three studies (Boyle and Boucher, 2000; Buttner et al., 2013; Saleh et al., 2012), and classification of exposures in three studies (Aydin et al., 2005; Boyle and Boucher, 2000; Wang, 2008) (Table 2). Three studies were at critical risk of bias because the serious risk of bias was found in more than one domain (Boyle and Boucher, 2000; Saleh et al., 2012; Wang, 2008), and eleven studies had serious risk of bias in one domain (Aydin et al., 2005; Bloch et al., 2005; Buttner et al., 2013; Lee et al., 2015; Martini et al., 2015; McGill et al., 1995; Poçan et al., 2013; Roomruangwong et al., 2016; Spangenberg and Pieters, 1991; Turkcapar et al., 2015; Zhang, 2011). Studies with a very low survey response rate (<20%) (Boyle and Boucher, 2000) and

inappropriate criteria for recruiting participants (Buttner et al., 2013; Saleh et al., 2012) contributed to the serious risk of bias in participants selection; studies providing only unadjusted results were rated as serious risk of bias in relation to confounding (Bloch et al., 2005; Boyle and Boucher, 2000; Lee et al., 2015; Martini et al., 2015; McGill et al., 1995; Poçan et al., 2013; Roomruangwong et al., 2016; Saleh et al., 2012; Spangenberg and Pieters, 1991; Turkcapar et al., 2015; Wang, 2008; Zhang, 2011); studies with no clear definition of PMS were at serious risk of PMS misclassification (Aydin et al., 2005; Boyle and Boucher, 2000; Wang, 2008). Only five studies were judged at an overall moderate risk of bias (Garcia-Esteve et al., 2008; Kara et al., 2008; Limlomwongse and Liabsuetrakul, 2006; Maliszewska et al., 2017; Sylvén et al., 2013). No study was rated as low risk of bias.

Association between PMS and PPD

Fifteen of the 19 included studies indicated a positive association between a history of PMS before pregnancy and PPD (Aydin et al., 2005; Boyle and Boucher, 2000; Buttner et al., 2013; Garcia-Esteve et al., 2008; Kara et al., 2008; Lee et al., 2015; Limlomwongse and Liabsuetrakul, 2006; Maliszewska et al., 2017; McGill et al., 1995; Saleh et al., 2012; Spangenberg and Pieters, 1991; Sylvén et al., 2013; Turkcapar et al., 2015; Wang, 2008; Zhang, 2011) and the remaining four studies reported a non-significant association (Bloch et al., 2005; Martini et al., 2015; Poçan et al., 2013; Roomruangwong et al., 2016) (Table 1). Pooling of the ORs derived from each study yielded an overall OR of 2.20 (95% CI: 1.81-2.68). Subgroup analyses showed a slightly higher pooled estimate in studies with a moderate risk of bias than that of studies with a critical or serious risk of bias (2.42, 95% CI: 1.81-3.22 vs 2.16, 95% CI: 1.68-2.78) (Figure 2). Estimates of the association were similar in both cross-sectional/case-control studies and cohort studies (Figure S1), in studies where the criteria of core PMDs was not fulfiled versus was fulfiled (Figure S2), and in studies where

PPD cases were screened positive compared to studies in which PPD was diagnosed (Figure S3).

The funnel plot showed that small studies appear to be missing in the area near the null effect (where lnOR=0), with the asymmetry possibly due to publication bias (Figure 3). After applying the trim-and-fill method, the OR estimate containing imputed estimates from unpublished studies was reduced to 1.83 (95% CI: 1.45-2.30) (Figure S4).

Discussion

Principal findings

To our knowledge, this is the first systematic review and meta-analysis that specifically summarises evidence on the association between history of PMS prior to pregnancy and PPD with regards to the same pregnancy. Our results showed that compared to women without a history of PMS, those with a history of PMS before pregnancy had more than twice the odds of developing PPD within the first 12 months after childbirth. This association did not differ by study design, definition of PMS, or assessment approach of PPD. Although publication bias was indicated, the OR estimate after including imputed results from potentially unpublished studies was only slightly reduced, illustrating the robustness of our findings.

Comparison with previous literature

Our conclusion is consistent with the recent systematic review of Amiel Castro et al. (Amiel Castro et al., 2018) that PMS seems to be a risk factor for PPD development. Eight studies included in that review were excluded from the present study: two because they investigated the effect of PPD history before the index pregnancy and PMS development after delivery (Haywood et al., 2007; Warner et al., 1991); another two as they examined the lifetime comorbidity between PMS and PPD (Kim et al., 2016; Yang et al., 2015); one study was excluded from the meta-analysis because number of PMS symptoms was used as the

exposure (Dennis and Ross, 2006); another two because PPD was measured in the immediate postpartum period (De Morais et al., 2013; Dennis and Ross, 2006); and one study was excluded because a control group of women free of PMS was not included (Studd, 2014).

Interpretation

One theoretical underpinning of the association between PMS and PPD is that vulnerability to oestrogen and progesterone fluctuations leads to the occurrence of the two conditions in the same subset of women (Schiller et al., 2016; Yonkers et al., 2008). Because levels of oestrogen and progesterone are associated with biological systems, neural networks and behaviours that are implicated in mood regulation, changes in their levels may thereafter trigger affective dysregulation in the premenstrual and postpartum period when hormone fluctuations take place (Schiller et al., 2016). For instance, the luteal phase is where PMS occurs due to the abrupt drop in oestrogen and progesterone levels and remits when a low and stable level of hormone is reached (Schiller et al., 2016). Similarly, the estrogen level increases 100- to 1000-fold and the progesterone level increases about 10- to 20-fold during pregnancy, but drop to the pre-pregnancy level immediately after delivery, when PPD may start to develop (Schiller et al., 2016). However, this explanation may not apply to women who had a history of PMS but developed PPD in their late postpartum period, when the level of hormones remains stable. For example, in one of our included studies, McGill and colleagues identified a positive association between history of PMS and PPD occurrence between 6 and 9 months after delivery (McGill et al., 1995). Further studies are needed to elucidate the underlying mechanism.

Strengths and limitations

A major strength of the present study is that the evidence of the effect of PMS before pregnancy on PPD development was disentangled from evidence of the comorbidity between

PMS and PPD and the effect of PPD on development of PMS (Amiel Castro et al., 2018; Haywood et al., 2007), and meta-analyses estimated the magnitude of this association. A second strength of this study is exclusion of studies that measured PPD within one week postpartum thus improving the specificity of our results. Because postpartum blues with mild symptoms typically occur within the first few days after delivery but normally resolve within one week, it is hard to distinguish this condition from PPD (Viguera, 2018). If the measurement of depressive symptoms was administered in the immediate postpartum period, the high prevalence of postpartum blues affecting 75% of women would result in a high false-positive rate of PPD (Dennis and Ross, 2006). Another strength of the study is the consistency of the overall evidence from population-based studies supporting a large positive association between the pre-pregnancy history of PMS and PPD, even after accounting for potential publication bias.

The results of this study need to be interpreted with caution due to the following limitations. The main limitation is the conclusion was based on low-quality studies. First, none of the included studies documented PMS symptoms prospectively, which is a prerequisite of PMS diagnosis required in various criteria (American College of Obstetricians and Gynecologists, 2000; American Psychiatric Association, 1994; Royal College of Obstetricians & Gynaecologists, 2017). Albeit the difficulty of achieving this in research settings (Buttner et al., 2013; Steiner et al., 2003; Sternfeld et al., 2002), this oversight may result in misclassification of PMS. Second, the PMS definition in most of the included studies (12 out of 19) (Aydin et al., 2005; Boyle and Boucher, 2000; Kara et al., 2008; Limlomwongse and Liabsuetrakul, 2006; Maliszewska et al., 2017; McGill et al., 1995; Poçan et al., 2013; Roomruangwong et al., 2016; Saleh et al., 2012; Spangenberg and Pieters, 1991; Turkcapar et al., 2015; Wang, 2008) did not meet the criteria of core PMDs, which likely led to the inclusion of women with physiological premenstrual symptoms, potentially distorting the true

relationship between history of PMS and PPD. Third, more than half of the original OR estimates (Bloch et al., 2005; Boyle and Boucher, 2000; Lee et al., 2015; Martini et al., 2015; McGill et al., 1995; Poçan et al., 2013; Roomruangwong et al., 2016; Saleh et al., 2012; Spangenberg and Pieters, 1991; Turkcapar et al., 2015; Wang, 2008; Zhang, 2011) were unadjusted. Even among the nine studies that observed a positive association between history of depression and PPD (Boyle and Boucher, 2000; Garcia-Esteve et al., 2008; Kara et al., 2008; Martini et al., 2015; McGill et al., 1995; Roomruangwong et al., 2016; Turkcapar et al., 2015; Wang, 2008; Zhang, 2011), only two studies (Garcia-Esteve et al., 2008; Kara et al., 2008) adjusted for history of depression. Another limitation is that we used a broad time frame to define PPD (depressive symptoms that occur within one year after childbirth), which allowed the inclusion of studies that used various time frames for PPD detection. Most of the included studies (13 out of 19) (Bloch et al., 2005; Garcia-Esteve et al., 2008; Kara et al., 2008; Lee et al., 2015; Limlomwongse and Liabsuetrakul, 2006; Maliszewska et al., 2017; Poçan et al., 2013; Roomruangwong et al., 2016; Saleh et al., 2012; Sylvén et al., 2013; Turkcapar et al., 2015; Wang, 2008; Zhang, 2011) assessed PPD within 3 months after delivery. Although the DSM specifies the onset of PPD to be within 4 weeks after delivery (American Psychiatric Association, 1994, 2013), researchers have long appealed for the extension of this period to six months or even further (Segre, 2013). In fact, the one-year time frame is widely used to define PPD in both clinical practice and research settings (Fredriksen et al., 2017; Gavin et al., 2005; O'Hara and McCabe, 2013; O'Hara and Wisner, 2014), and more specifically in prevention studies (O'Hara and McCabe, 2013). As we aimed to understand whether history of PMS is a potential predictor of PPD that could inform new strategies of PPD prevention, we included studies that assessed PPD up to one year after delivery. Last, some publication bias was also detected.

Implication for future studies

Despite the fact that all relevant evidence was synthesised in the present study, there were a number of potential biases in the original studies. We suggest researchers who aim to further investigate whether pre-pregnancy history of PMS increases the risk of PPD development consider the following issues. First, although a history of depression strongly increases the risk of PPD (Ghaedrahmati et al., 2017; O'Hara and Swain, 1996; Silverman et al., 2017), a significant proportion of women experience PPD as their first-ever depressive episode (Banti et al., 2011; Sylvén et al., 2017). Hence, the population who develop PPD subsumes two distinct subgroups: those who experience PPD as the first depressive episode and those who experience PPD as a recurrence of previous depressive episode(s) (Cooper and Murray, 1995), differentiating from each other in the pathophysiology (Altemus et al., 2012; Kettunen et al., 2014). Moreover, those who develop PPD as their first depressive episode have been shown to be at a notably high risk of recurrence of PPD in later births (Cooper and Murray, 1995; Rasmussen et al., 2017), and are relatively more difficult to identify because they have no previous experience in seeking medical help for depression, compared to those who had a previous depressive episode (Nonacs, 2017). Therefore, women who develop PPD as their first depressive episode should be distinguished from those who develop PPD as a recurrent depressive episode, when investigating the relationship of interest. In this way, researchers could provide evidence more targeted to prevent PPD in the specific vulnerable group. So far, only one study has specifically investigated the association of interest in women without a previous depressive episode (Sylvén et al., 2017). Second, a prospective cohort study would be the preferred study design for examining the relationship between PMS history before pregnancy and PPD, enabling chronological documenting of PMS symptoms and ensuring the temporal sequence of PMS before PPD. Longitudinal studies with repeated measures of PPD would be useful in determining the role of important covariates, such as parity on PPD.

A cohort of women selected from the community or the general population, who are not seeking help for either PMS or PPD could largely prevent the bias in selection of participants. Third, clinically diagnosed PPD would be the most accurate outcome for investigating risk factors of PPD; however, this might be challenging to achieve in research settings. Utilising electronic health records or administrative data that captures diagnosis and/or treatment for PPD might solve this dilemma (Dietz et al., 2007; Petersen et al., 2018). Otherwise, using validated screening tools to assess PPD or self-reports of PPD that have been validated could also provide fair-quality evidence. Finally, risk factors of PPD including history of depression and lack of social support (Ghaedrahmati et al., 2017; O'Hara and Swain, 1996), as well as possible confounders between PMS and PPD such as maternal age (Abdollahi et al., 2014; Farahmand et al., 2017; Liu et al., 2017), pre-pregnancy BMI (Bertone-Johnson et al., 2008; Ertel et al., 2017; LaCoursiere et al., 2010) (Bertone-Johnson et al., 2008; Ertel et al., 2017; LaCoursiere et al., 2010), self-perceived stress (Gao et al., 2009; Gollenberg et al., 2010; Ruyak et al., 2016), smoking (Bertone-Johnson et al., 2008; Chen et al., 2019; Quelopana et al., 2011) and oral contraceptive use (Horibe et al., 2018; Roberts and Hansen, 2017; Yonkers et al., 2005), should be fully considered when assessing the association of interest. If well-designed studies confirm the significant association between pre-pregnancy PMS and development of PPD, history of PMS should be additionally incorporated in the checklist which is currently used by clinical practitioners during antenatal check-ups and/or postpartum visits to screen women at risk of PPD (Centre of Perinatal Excellence, 2017; US Preventive Services Task Force, 2019).

Conclusion

In summary, the findings from this systematic review and meta-analysis support a significant association between history of PMS before pregnancy and PPD development following

pregnancy. This conclusion suggests the potential benefit of collecting women's PMS history during antenatal check-ups and/or postpartum visits in reducing the risk of PPD. However, well-designed prospective studies considering the limitations of the current evidence are needed to further articulate the relationship between pre-pregnancy history of PMS and development of PPD.

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Table list

Figure Caption List

Supporting Information

PMDs subgroup, as fulfilling the criteria for core PMDs recommended by both the ISPMD consensus and the RCOG guideline, while the remaining studies not meeting the criteria of core PMDs were grouped into the other subgroup.

Figure S3. Forest plot for the association between PMS and PPD, stratified by the assessment approach of PPD (screening vs diagnosis). Studies that used screening scale determining PPD were grouped into the screening subgroup while studies that used clinical diagnoses identifying PPD were grouped into the diagnosis subgroup.

Figure S4. Trim-and-fill funnel plot. A funnel-plot-based method produced a new estimate of the association containing imputed etimates from unpublished studies (OR=1.83, 95% CI: 1.45-2.30).

Table 1. General characteristics of the included studies of the association of premenstrual syndrome with postpartum depression.

First author, publication year	Study design	Country	Age	N	PMS definition		PPD assessment		Association of PMS and PPD	Covariates adjusted
					Symptoms *	Interferes daily life§	Criteria	Timing		
Aydin, 2005	CS	Turkey	N/A	728	Either	No	EPDS≥13	<1 year	Positive	Previous psychiatric history, husband unemployment, stressful life events during pregnancy, husband support, temperamental child, sick infant
Bloch, 2005	CS	Israel	30.4±5.6	210	Psychological, PMDD	Yes	SCID diagnosis	6-8 weeks	Non-significant	Not adjusted
Boyle, 2000	CS	Australia	20-51	51	Either	No	EPDS≥13	1-12 months	Positive	Not adjusted
Buttner, 2013	CS	US	18-50	478	Psychological	Yes	SCID diagnosis	<1 year	Positive	Previous depression history, age, ethnicity, education, marital status, breastfeeding
Garcia, 2008	CC	Spain	30.5±4.74	334	Psychological	Yes	SCID diagnosis	6 weeks	Positive	Previous depression history, relationship with partner, social support during pregnancy
Kara, 2007	CS	Turkey	N/A	163	Psychological	No	BDI≥17	1-3 months	Positive	Previous depression, number of births, induced abortion
Lee, 2015	CS	Korea	N/A	166	Both, PMDD	Yes	EPDS≥10 BDI≥10	10-14 day	Positive	Not adjusted
Limlomwongse, 2006	C	Thailand	N/A	525	Psychological	No	EPDS≥10	6-8 weeks	Positive	Religion, perception of pregnancy complications, attitudes towards this pregnancy
Maliszewska, 2017	CS	Poland	Mean: 30.37	387	Both	No	EPDS≥13	4-8 weeks	Positive	Previous psychiatric disorder, family history of psychiatric disorder, EDPS>12 in the first week of puerperium, relationship other than marriage, employment before pregnancy, tobacco and alcohol use during pregnancy, premature delivery, breastfeeding, BMI≥30 before

										pregnancy, personal trait, social support
Martini, 2015	C	Germany	18-40	306	Psychological	Yes	CIDI-V diagnosis	10 days, 2, 4 and 16 months	Non-significant	Not adjusted
McGill, 1995	CS	New Zealand	NA	1330	Psychological	No	EPDS≥12	6-9 months	Positive	Not adjusted
Poçan, 2013	CS	Turkey	29.27±4.90	187	Psychological	No	EPDS≥13	4-6 weeks	Non-significant	Not adjusted
Roomruangwong, 2016	CS	Thailand	≥18	313	Both	No	EPDS≥11	4-6 weeks	Non-significant	Not adjusted
Saleh, 2012	CC	Egypt	N/A	120	Psychological	No	SCID diagnosis	4 weeks	Positive	Not adjusted
Spangenberg, 1991	CS	South Africa	N/A	81	Psychological	No	BDI≥10	2 weeks-6 months	Positive	Not adjusted
Sylvén, 2013	C	Sweden	30.8±4.6	2318	Both	Yes	EPDS≥12	6 weeks	Positive	Previous psychiatric contact, maternal age, mood swings from oral contraceptives, nausea during pregnancy, sleep and breastfeeding at five days postpartum
Turkcapar, 2015	C	Turkey	26.12±5.15	540	Psychological	No	EPDS≥13	6-8 weeks	Positive	Not adjusted
Wang, 2008	C	China	Mean: 31.04	274	Either	No	SCID diagnosis	6 weeks	Positive	Not adjusted
Zhang, 2011	C	China	28.35±3.87	479	Both	Yes	BDI≥5	7-30 days	Positive	Not adjusted

* Refers to the type of premenstrual symptoms required in the original study to define PMS; grouped as physical/psychological/either/both; if studies specifically defined PMDD then additionally indicated

§ Refers to the severity of symptoms; assessed by whether significantly interferes with women's daily life

PMDD: premenstrual dysphoric disorder

CC: case-control study; CS: cross-sectional study; C: cohort study

Core PMDs: core premenstrual disorders, referring to the definition of PMS in original studies meeting the criteria defined in the ISPMD consensus [20] and the Royal College of Obstetricians and Gynaecologists (RCOG) guideline for managing PMS [21]

EPDS: the Edinburgh Postnatal Depression Scale

SCID: the Structured Clinical Interview using DSM-IV criteria

CIDI-V: the Composite International Diagnostic Interview for Women, WHO

PSST: the Premenstrual Symptoms Screening Tool

BDI: the Beck Depression Inventory

Table 2. Results of risk of bias assessment using the Risk of Bias Instrument for Non-Randomized Studies of Exposures (ROBINS-E).

Study	Bias due to							Overall bias
	Confounding	Selection of participants	Classification of exposures	Deviation from exposures	Missing data	Measurement of outcomes	Selection of reported result	
Aydin, 2005	Moderate	Moderate	Serious	Low	Low	Moderate	Low	Serious
Bloch, 2005	Serious	Moderate	Moderate	Low	Low	Low	Low	Serious
Boyle, 2000	Serious	Serious	Serious	Low	Low	Moderate	Low	Critical
Buttner, 2013	Moderate	Serious	Low	Low	Low	Moderate	Low	Serious
Garcia, 2008	Moderate	Moderate	Moderate	Low	Low	Moderate	Low	Moderate
Kara, 2007	Moderate	Moderate	Moderate	Low	Low	Moderate	Low	Moderate
Lee, 2015	Serious	Moderate	Moderate	Low	Low	Moderate	Low	Serious
Limlomwongse, 2006	Moderate	Moderate	Moderate	Low	Moderate	Moderate	Low	Moderate
Maliszewska, 2017	Moderate	Moderate	Moderate	Low	Low	Moderate	Low	Moderate
Martini, 2015	Serious	Moderate	Low	Low	Moderate	Low	Low	Serious
McGill, 1995	Serious	Moderate	Moderate	Low	Low	Moderate	Low	Serious
Poçan, 2013	Serious	Low	Moderate	Low	Low	Moderate	Low	Serious
Roomruangwong, 2016	Serious	Low	Moderate	Low	Low	Moderate	Low	Serious

Saleh, 2012	Serious	Serious	Moderate	Low	Low	Low	Low	Critical
Spangenberg, 1991	Serious	Moderate	Moderate	Low	Low	Moderate	Low	Serious
Sylven, 2013	Moderate	Moderate	Moderate	Low	Moderate	Low	Low	Moderate
Turkcapar, 2015	Serious	Moderate	Moderate	Low	Moderate	Low	Low	Serious
Wang, 2008	Serious	Moderate	Serious	Low	Moderate	Moderate	Low	Critical
Zhang, 2011	Serious	Low	Moderate	Low	Low	Moderate	Low	Serious

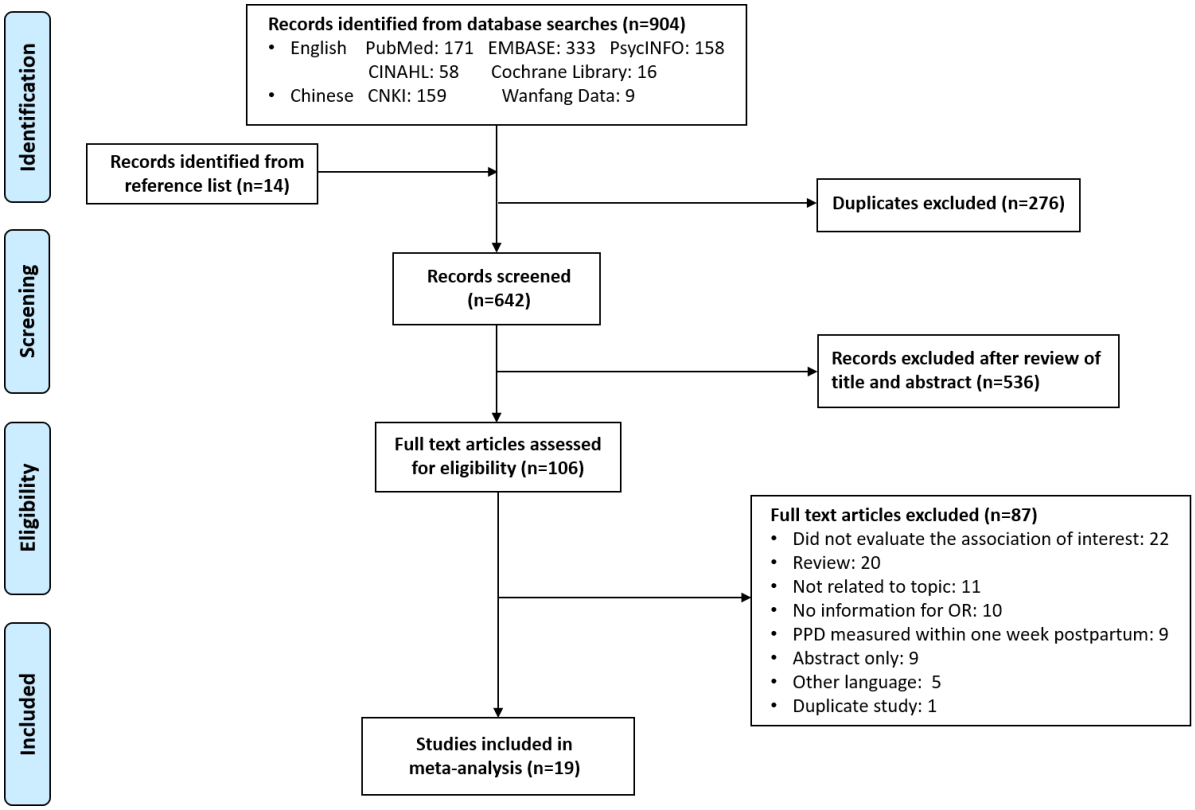

Figure 1. Flow chart of the selection of included studies. Systematic selection of articles and the main reasons for exclusion, based on PRISMA 2009 flow diagram

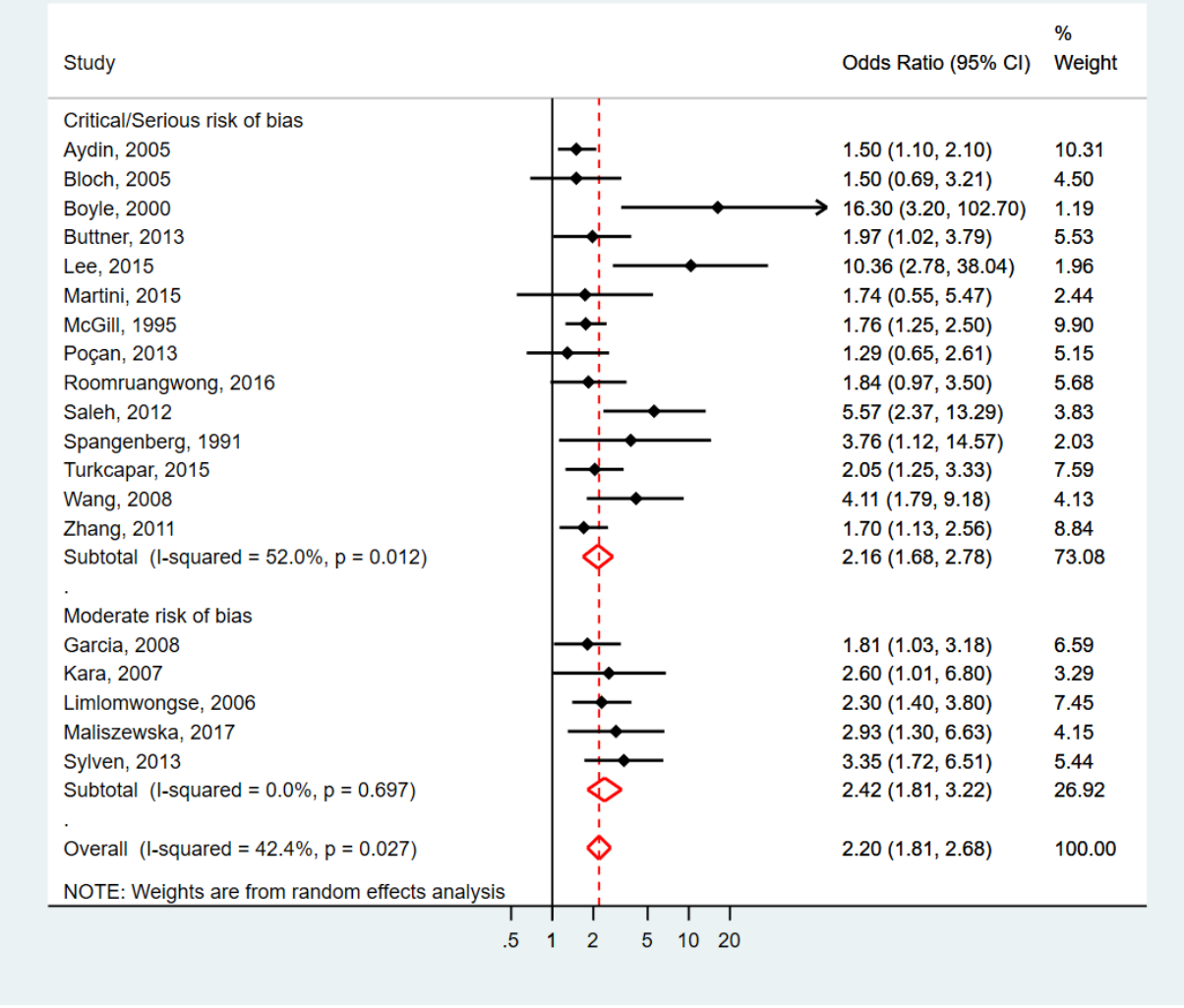

Figure 2. Forest plot for the association between PMS and PPD, stratified by the risk of bias based on ROBINS-E (critical/serious risk of bias vs moderate risk of bias). Studies with an overall critical or serious risk of bias were grouped together as opposed to studies with moderate risk of bias.

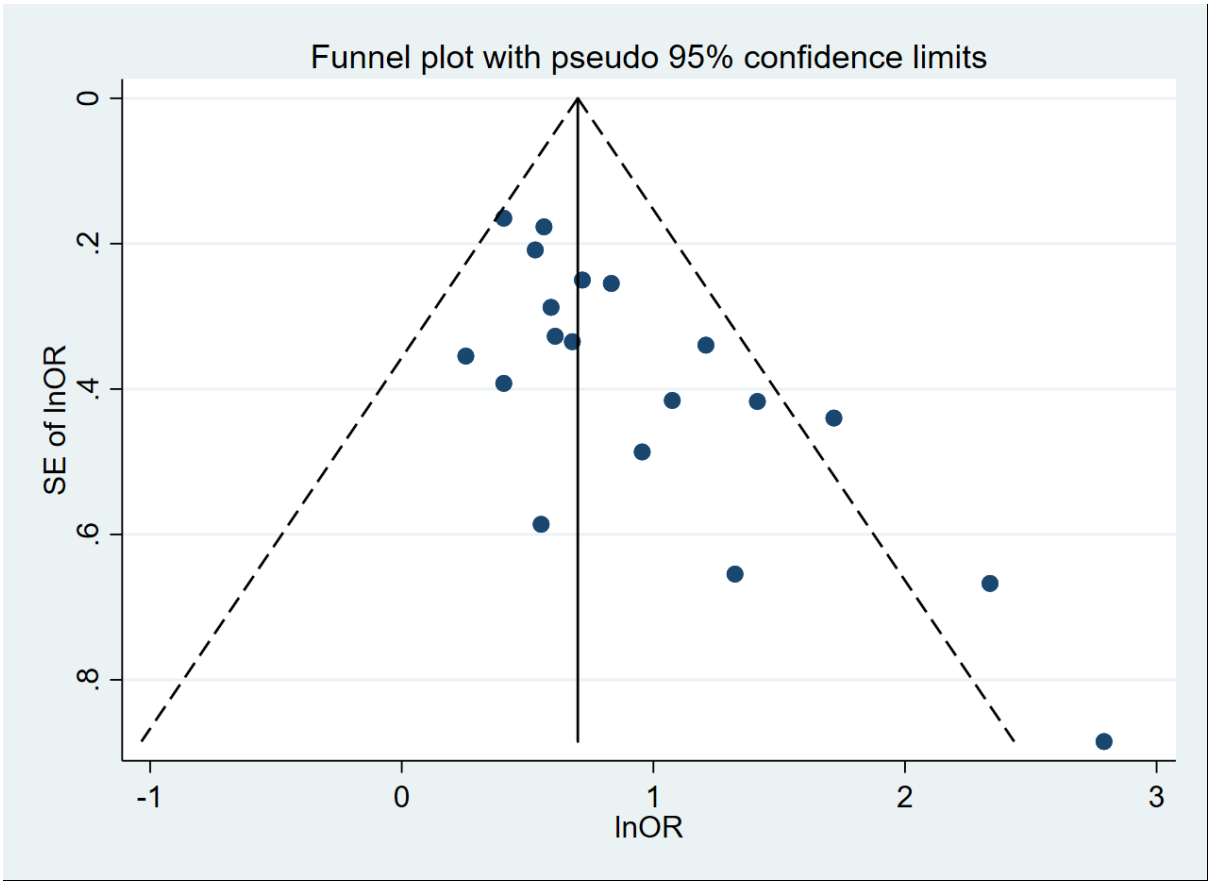

Figure 3. Funnel plot. Each dot represents a different study. Asymmetry indicates smaller studies without statistically significant effects remain unpublished.

Appendix S1. Search strategies of identification of studies.

Database	ID	Search	Items found
PubMed	#1	(((((("Premenstrual Syndrome"[Mesh]) OR premenstrual tension OR pre-menstrual tension OR premenstrual tensions OR pre-menstrual tensions OR premenstrual syndrome OR pre-menstrual syndrome OR premenstrual syndromes OR pre-menstrual syndromes OR premenstrual tension syndrome OR premenstrual tension syndromes OR pre-menstrual tension syndrome OR pre-menstrual tension syndromes OR premenstrual dysphoric disorder OR pre-menstrual dysphoric disorder OR premenstrual dysphoric disorders OR pre-menstrual dysphoric disorders OR PMS OR PMT OR PMDD)))	11533
	#2	((((((((((PPD) OR (((((("Depression, Postpartum"[Mesh]) OR post-natal[tiab] depress*[tiab]) OR postnatal[tiab] depress*[tiab]) OR postpartum[tiab] depress*[tiab]) OR post-partum[tiab] depress*[tiab]))))) OR ((((Postpartum depression) OR postnatal depression) OR Post-Natal Depression) OR Post-Partum Depression))))))))	20303
	#3	#1 AND #2	171
EMBASE	#1	'premenstrual syndrome'/exp	5978
	#2	'premenstrual dysphoric disorder'/exp	1193
	#3	'pre-menstrual dysphoric disorders' OR 'pre-menstrual dysphoric disorder' OR 'premenstrual dysphoric disorders' OR 'premenstrual dysphoric disorder'	1540
	#4	'pre-menstrual tensions' OR 'pre-menstrual tension' OR 'premenstrual tensions' OR 'premenstrual tension'	642
	#5	'pre-menstrual syndromes' OR 'pre-menstrual syndrome' OR 'premenstrual syndromes' OR 'premenstrual syndrome'	6348

	#6	'pre-menstrual tension syndromes' OR 'pre-menstrual tension syndrome' OR 'premenstrual tension syndromes' OR 'premenstrual tension syndrome'	157
	#7	'pmdd' OR 'pmt' OR 'pms'	23325
	#8	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7	28471
	#9	'postnatal depression'/exp	10170
	#10	'post-natal depression' OR 'postnatal depression' OR 'post-partum depression' OR 'postpartum depression'	12326
	#11	'post natal':ab,ti AND depress*:ab,ti	477
	#12	postnatal:ab,ti AND depress*:ab,ti	7405
	#13	'post partum':ab,ti AND depress*:ab,ti	1102
	#14	postpartum:ab,ti AND depress*:ab,ti	7879
	#15	'ppd'	12726
	#16	'pnd'	6232
	#17	#9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16	34876
	#18	#8 AND #17	333
PsycINFO	#1	((((AnyField:(pmdd)))) OR (((AnyField:(pmt)))) OR (((AnyField:(pms)))) OR (((AnyField:(premenstrual tension)) OR (AnyField:(premenstrual tensions)) OR (AnyField:(pre-menstrual tension)) OR (AnyField:(pre-menstrual tensions)) OR (AnyField:(premenstrual syndrome)) OR (AnyField:(premenstrual syndromes)) OR (AnyField:(pre-menstrual syndrome)) OR (AnyField:(pre-menstrual syndromes)) OR (AnyField:(premenstrual tension syndrome)) OR (AnyField:(premenstrual tension syndromes)) OR (AnyField:(pre-menstrual tension syndrome)) OR (AnyField:(pre-menstrual tension syndromes)))) OR (((AnyField:(pre-menstrual dysphoric disorders)))) OR (((AnyField:(premenstrual dysphoric disorders)))) OR (((AnyField:(pre-menstrual	

		dysphoric disorder)))) OR (((AnyField:(premenstrual dysphoric disorder)))) OR (((IndexTerms:(Premenstrual Dysphoric Disorder)))) OR (((IndexTerms:(Premenstrual Syndrome)))))	
	#2	((((IndexTerms:(Postpartum Depression)))) OR (((AnyField:(post-partum depression)))) OR (((AnyField:(postpartum depression)))) OR (((AnyField:(post-natal depression)))) OR (((AnyField:(postnatal depression)))) OR (((((abstract:(post natal)))) OR (((title:(post natal))))) AND ((((abstract:(depress*)))) OR (((title:(depress*)))))) OR (((((abstract:(postnatal)))) OR (((title:(postnatal))))) AND ((((abstract:(depress*)))) OR (((title:(depress*)))))) OR (((((abstract:(post partum)))) OR (((title:(post partum))))) AND ((((abstract:(depress*)))) OR (((title:(depress*)))))) OR (((((abstract:(postpartum)))) OR (((title:(postpartum))))) AND ((((abstract:(depress*)))) OR (((title:(depress*)))))) OR (((AnyField:(PPD)))) OR (((AnyField:(PND)))))	
	#3	#1 AND #2	158
CINAHL	#1	(MH "Premenstrual Syndrome")	1408
	#2	(MH "Premenstrual Dysphoric Disorder")	241
	#3	'pre-menstrual dysphoric disorder'	4
	#4	'premenstrual tension'	29
	#5	'pre-menstrual tension'	4
	#6	'premenstrual syndrome'	1556
	#7	'pre-menstrual syndrome'	24
	#8	'premenstrual tension syndrome'	11
	#9	'pre-menstrual tension syndrome'	1
	#10	premenstrual dysphoric disorder'	374

#11	'pms'	1087
#12	'pmt'	253
#13	'pmdd'	194
#14	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13	2589
#15	(MH "Depression, Postpartum")	4965
#16	'post-partum depression'	129
#17	'postpartum depression'	5477
#18	'post-natal depression'	79
#19	'postnatal depression'	2931
#20	TI 'post natal' OR AB 'post natal'	819
#21	TI depress* OR AB depress*	118443
#22	S20 AND S21	111
#23	TI postnatal OR AB postnatal	12719
#24	S23 AND S21	2401
#25	TI postpartum OR AB postpartum	16972
#26	S25 AND S21	3532
#27	TI 'post partum' OR AB 'post partum'	1836
#28	S27 AND S21	256
#29	'PPD'	1296

	#30	'PND'	504
	#31	S15 OR S16 OR S17 OR S18 OR S19 OR S22 OR S24 OR S26 OR S28 OR S29 OR S30	8378
	#32	S14 AND S31	58
Cochrane	#1	'pre-menstrual dysphoric disorder'	9
	#2	'premenstrual dysphoric disorder'	238
	#3	'premenstrual dysphoric disorders'	74
	#4	'pre-menstrual dysphoric disorders'	5
	#5	'premenstrual tension'	123
	#6	'pre-menstrual tension'	5
	#7	'premenstrual tensions'	1
	#8	'pre-menstrual tensions'	0
	#9	'premenstrual syndrome'	764
	#10	'premenstrual syndromes'	27
	#11	'pre-menstrual syndrome'	30
	#12	'pre-menstrual syndromes'	2
	#13	'premenstrual tension syndrome'	101
	#14	'pre-menstrual tension syndrome'	4
	#15	'pre-menstrual tension syndromes'	2
	#16	'premenstrual tension syndromes'	14

	#17	'pms'	1170
	#18	'pmt'	160
	#19	'pmdd'	162
	#20	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19	1986
	#21	'post-partum depression'	158
	#22	'postpartum depression'	1331
	#23	'post-natal depression'	64
	#24	'postnatal depression'	990
	#25	'post natal':ab,ti and depress*:ab,ti	45
	#26	postnatal:ab,ti and depress*:ab,ti	589
	#27	postpartum:ab,ti and depress*:ab,ti	877
	#28	'post partum':ab,ti and depress*:ab,ti	99
	#29	'ppd'	871
	#30	'pnd'	69
	#31	#21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30	2586
	#32	#20 and #31	16
CNKI	#1	(全文=经前紧张) OR (全文=月经前紧张) OR (全文=经前综合征) OR (全文=经前综合症) OR (全文=经前期烦躁障碍) OR (全文=经前焦虑障碍) OR (全文=经前不悦)	2184

	#2	(全文=产后抑郁) OR (全文=产后抑郁症)	15148
	#3	#1 AND #2	159
Wanfang	#1	全部: 经前紧张 OR 全部: 月经前紧张 OR 全部: 经前综合征 OR 全部: 经前综合症 OR 全部: 经前期烦躁障碍 OR 全部: 经前焦虑障碍 OR 全部: 经前不悦	1312
	#2	全部: 产后抑郁 OR 全部: 产后抑郁症	8946
	#3	#1 AND #2	9

Table S1. Documentation on excluded studies.

No.	Reference	Reason
1	Yang F, Gardner CO, Bigdeli T, et al. Clinical features of and risk factors for major depression with history of postpartum episodes in Han Chinese women: A retrospective study. *Journal of Affective Disorders.* 2015;183:339-346.	The study investigated the lifetime comorbidity of PMS and PPD in women with recurrent major depression
2	Kim K, Hong JP, Cho MJ, et al. Loss of sexual interest and premenstrual mood change in women with postpartum versus non-postpartum depression: A nationwide community sample of Korean adults. *Journal of Affective Disorders.* 2016;191:222-229.	The study investigated the lifetime comorbidity of PMS and
3	Kepple AL, Lee EE, Haq N, Rubinow DR, Schmidt PJ. History of postpartum depression in a clinic-based sample of women with premenstrual dysphoric disorder. *Journal of Clinical Psychiatry.* 2016;77(4):e415-e420.	The study investigated the lifetime comorbidity of PMS and
4	Gregory RJ, Masand PS, Yohai NH. Depression Across the Reproductive Life Cycle: Correlations Between Events. *Primary care companion to the Journal of clinical psychiatry.* 2000;2(4):127-129.	The study investigated the lifetime comorbidity of PMS and
5	龙周婷. *产后抑郁预测因素的纵向研究* [硕士], 山东大学; 2014.	The study did not evaluate the association between PMS before pregnancy and PPD development in the main text
6	金锦珍. *延边地区产后抑郁现状及其影响因素调查分析* [硕士], 延边大学; 2008.	The study did not evaluate the association between PMS before pregnancy and PPD development in the main text
7	石杰. 浅析产后抑郁症的相关因素及对策. *医药前沿.*6(30):382-383.	The study did not evaluate the association between PMS before pregnancy and PPD development in the main text

8	林秀英. 26 例产后抑郁症的临床护理分析. *中国计划生育和妇产科.* 2009;1(1):37-39.	The study did not evaluate the association between PMS before pregnancy and PPD development in the main text
9	Dalton K. Prospective Study into Puerperal Depression. *British Journal of Psychiatry.* 1971;118(547):689-692.	The study did not evaluate the association between PMS before pregnancy and PPD development in the main text
10	Abdollahi F, Zarghami M, Azhar MZ, Sazlina SG, Lye MS. Predictors and incidence of post-partum depression: A longitudinal cohort study. *Journal of Obstetrics and Gynaecology Research.* 2014;40(12):2191-2200.	The study did not evaluate the association between PMS before pregnancy and PPD development in the main text
11	Dalton K. Puerperal and premenstrual depression. *Proceedings of the Royal Society of Medicine.* 1971;64(12):1249-1252.	The study did not evaluate the association between PMS before pregnancy and PPD development: it is a case study discussing the co-occurrence of PMS and PPD
12	Kennerley H, Gath D. Maternity blues: III. Associations with obstetric, psychological, and psychiatric factors. *The British Journal of Psychiatry.* 1989;155:367-373.	The outcome was not PPD: maternity blues
13	Condon JT, Watson TL. The maternity blues: exploration of a psychological hypothesis. *Acta psychiatrica Scandinavica.* 1987;76(2):164-171.	The outcome was not PPD: maternity blues
14	Pop VJM, Essed GGM, De Geus CA, Van Son MM, Komproe IH. Prevalence of post partum depression - Or is it post-puerperium depression? *Acta Obstetricia et Gynecologica Scandinavica.* 1993;72(5):354-358.	The exposure was not PMS before pregnancy: the association of PMS after delivery and PPD development was examined
15	Lau Y. *The role of social support in antenatal and postnatal depressive symptoms and family conflicts among Hong Kong Chinese women: A three-wave prospective longitudinal study*. US, ProQuest Information & Learning; 2008.	The exposure was not PMS before pregnancy: premenstrual mood change was combined with menstruation discomfort and their effects on PPD development were examined

16	齐晓梅. *围生期心境状态改变及相关因素的探讨* [博士], 天津医科大学; 2005.	The exposure was not PMS before pregnancy: PMS was combined with dysmenorrhea and their effects on PPD development were examined
17	Warner P, Bancroft J, Dixson A, Hampson M. The relationship between perimenstrual depressive mood and depressive illness. *Journal of Affective Disorders.* 1991;23(1):9-23.	The exposure was not PMS before pregnancy and the outcome was not PPD: the effect of PPD history on PMS development was examined
18	Haywood A, Slade P, King H. Is there evidence of an association between postnatal distress and premenstrual symptoms? *Journal of Affective Disorders*. 2007;99(1-3):241-245.	The exposure was not PMS before pregnancy and the outcome was not PPD: the effect of PPD history on PMS development was examined
19	Dennerstein L, Morse CA, Varnavides K. Premenstrual tension and depression — is there a relationship? *Journal of Psychosomatic Obstetrics & Gynecology.* 1988;8(1):45-52.	The exposure was not PMS before pregnancy and the outcome was not PPD: the effect of PPD history on PMS development was examined
20	O'Hara MW, Schlechte JA, Lewis DA, Wright EJ. Prospective study of postpartum blues. Biologic and psychosocial factors. *Archives of general psychiatry.* 1991;48(9):801-806.	The exposure was not PMS before pregnancy and the outcome was not PPD: the effect of postpartum blues history on PMS development was examined
21	Graze KK, Nee J, Endicott J. Premenstrual depression predicts future major depressive disorder. *Acta psychiatrica Scandinavica*. 1990;81(2):201-205.	The exposure was not PMS before pregnancy and the outcome was not PPD: the effect of PMS history on major depressive disorder in non-postpartum women was examined

22	Harrison WM, Endicott J, Nee J, Glick H, Rabkin JG. Characteristics of women seeking treatment for premenstrual syndrome. *Psychosomatics.* 1989;30(4):405-411.	The exposure was not PMS before pregnancy and the outcome was not PPD: the effect of PMS history on current psychiatric disorder in-non postpartum women was examined
23	Stoner R, Camilleri V, Calleja-Agius J, Schembri-Wismayer P. The cytokine-hormone axis - the link between premenstrual syndrome and postpartum depression. *Gynecological endocrinology : the official journal of the International Society of Gynecological Endocrinology.* 2017;33(8):588-592.	Review
24	Yalom ID, Lunde DT, Moos RH, Hamburg DA. "postpartum blues" syndrome: A description and related variables. *Archives of general psychiatry.* 1968;18(1):16-27.	Review
25	Studd J, Nappi RE. Reproductive depression. *Gynecological Endocrinology.* 2012;28(SUPPL.1):42-45.	Review
26	Flores-Ramos M. Mental disorders related to reproductive age women: A new proposal in the field of mental health. *Gaceta Medica de Mexico.* 2011;147(1):33-37.	Review
27	Qiu J, Xiao Z. Reproductive-related depression in women: A review of two decades of research in China. *Asia-Pacific Psychiatry.* 2010;2(1):19-25.	Review
28	True-Soderstrom BA, Buckwalter KC, Kerfoot KM. Postpartum depression. *Maternal-Child Nursing Journal.* 1983;12(2):109-118.	Review
29	Sweet M. Research. Who are the mothers at risk? *Kai Tiaki Nursing New Zealand.* 1996;2(4):13-15.	Review
30	Steiner M, Dunn EJ. The psychobiology of female-specific mood disorders. *Infertility and Reproductive Medicine Clinics of North America.* 1996;7(2):297-312.	Review

31	Parry BL. Postpartum depression in relation to other reproductive cycle mood changes. In: *Postpartum mood disorders.* Arlington, VA, US: American Psychiatric Association; 1999:21-45.	Review
32	Pariser SF, Nasrallah HA, Gardner DK. Postpartum mood disorders: Clinical perspectives. *Journal of Women's Health.* 1997;6(4):421-434.	Review
33	O'Hara MW. Post-partum 'blues,' depression, and psychosis: A review. *Journal of Psychosomatic Obstetrics & Gynecology.* 1987;7(3):205-227.	Review
34	Miller LJ, Girgis C, Gupta R. Depression and related disorders during the female reproductive cycle. *Women's Health.* 2009;5(5):577-587.	Review
35	Mehta S, Mehta N. An overview of risk factors associated to post-partum depression in Asia. *Mental Illness.* 2014;6(1):14-17.	Review
36	Kessler M, Riba M. Women's mental health: A global imperative. *Asia-Pacific Psychiatry.* 2010;2(1):1-3.	Review
37	Gitlin MJ, Pasnau RO. Depression in obstetric and gynecology patients. *Journal of Psychiatric Treatment & Evaluation.* 1983;5(5):421-428.	Review
38	Friedman CR. Reproductive psychiatry and sexuality. In: *Oxford American handbook of psychiatry.* New York, NY, US: Oxford University Press; 2008:493-531.	Review
39	Freeman MP. Depression: What's sex got to do with it? *The Journal of Clinical Psychiatry.* 2006;67(10):1610-1611.	Review
40	Chrisler JC, Johnston-Robledo I. Raging hormones? Feminist perspectives on premenstrual syndrome and postpartum depression. In: *Rethinking mental health and disorder: Feminist perspectives.* New York, NY, US: Guilford Press; 2002:174-197.	Review
41	Carnes JW. Psychosocial disturbances during and after pregnancy. *Postgrad Med.* 1983;73(1):135-141, 144-135.	Review

42	Banti S, Borri C, Camilleri V, et al. Perinatal mood and anxiety disorders. Clinical assessment and management. A review of current literature. *Italian Journal of Psychopathology.* 2009;15(4):351-366.	Review
43	Mazaheri MA, Rabiei L, Masoudi R, Hamidizadeh S, Nooshabadi MR, Najimi A. Understanding the factors affecting the postpartum depression in the mothers of Isfahan city. *Journal of education and health promotion.* 2014;3:65.	Not related to topic
44	Studd J. Hormone therapy for reproductive depression in women. *Post Reproductive Health.* 2014;20(4):132-137.	Not related to topic
45	Yang F, Zhao H, Wang Z, et al. Age at onset of recurrent major depression in Han Chinese women - a replication study. *J Affect Disord.* 2014;157:72-79.	Not related to topic
46	Tan EC, Tan HS, Chua TE, et al. Association of premenstrual/menstrual symptoms with perinatal depression and a polymorphic repeat in the polyglutamine tract of the retinoic acid induced 1 gene. *J Affect Disord.* 2014;161:43-46.	Not related to topic
47	Sampson GA, Jenner FA. Studies of daily recordings from the Moos Menstrual Distress Questionnaire. *The British Journal of Psychiatry.* 1977;130:265-271.	Not related to topic
48	Parry BL, Newton RP. Chronobiological basis of female-specific mood disorders. *Neuropsychopharmacology.* 2001;25(5 Suppl):S102-108.	Not related to topic
49	Jouppe J. On postpartum blues. *Annales Medico-Psychologiques.* 2007;165(10):749-767.	Not related to topic
50	Harrison WM, Endicott J, Rabkin JG, Nee JC, Sandberg D. Treatment of premenstrual dysphoria with alprazolam and placebo. *Psychopharmacol Bull.* 1987;23(1):150-153.	Not related to topic
51	Harrison WM, Endicott J, Nee J. Treatment of premenstrual dysphoria with alprazolam: A controlled study. *Archives of general psychiatry.* 1990;47(3):270-275.	Not related to topic
52	Graff LA, Dyck DG, Schallow JR. Predicting postpartum depressive symptoms: A structural modelling analysis. *Perceptual and Motor Skills.* 1991;73(3, Pt 2):1137-1138.	Not related to topic

53	Glangeaud-Freudenthal NMC. Perceptions of postnatal depression across countries and cultures: From a TransCultural Study of PostNatal Depression (TCS-PND), initiated by Channi Kumar. In: *Perinatal psychiatry: The legacy of Channi Kumar.* New York, NY, US: Oxford University Press; 2014:82-95.	Not related to topic
54.	韩鹏. 产后抑郁症的原因分析及预防对策. *医学信息.* 2015;28(13):205-205.	No information available for OR
55.	Sugawara M, Toda MA, Shima S, Mukai T, Sakakura K, Kitamura T. Premenstrual mood changes and maternal mental health in pregnancy and the postpartum period. *Journal of Clinical Psychology.* 1997;53(3):225-232.	No information available for OR
56.	张秋莲, 苟永玲. 产后抑郁症相关因素的探讨. *实用临床医学.* 2007;8(7):74-75.	No information available for OR
57.	狄江丽, 赵更力, 周敏, 张小松, 陈丽君. 产褥期抑郁情绪的前瞻性研究. *中国妇幼保健.* 2006(02):253-256.	No information available for OR
58.	Tian T, Li Y, Xie D, et al. Clinical features and risk factors for post-partum depression in a large cohort of Chinese women with recurrent major depressive disorder. *J Affect Disord.* 2012;136(3):983-987.	No information available for OR
59.	Dennis CL, Ross LE. Depressive symptomatology in the immediate postnatal period: Identifying maternal characteristics related to true- and false-positive screening scores. *Canadian Journal of Psychiatry.* 2006;51(5):265-273.	No information available for OR
60.	李禾, 沈汝, 杨惠娟, 何芳, 张雯, 丁辉. 产后抑郁的相关产科因素的研究. *实用预防医学.* 2008(01):170-171.	No information available for OR
61.	Playfair HR, Gowers JI. Depression following childbirth—a search for predictive signs. *The Journal of the Royal College of General Practitioners.* 1981;31(225):201-208.	No information available for OR
62.	刘爱兰. 产后忧郁和抑郁症的产生预防. *包头医学.* 2014(04):227-229.	No information available for OR

63.	Nott PN, Franklin M, Armitage C, Gelder MG. Hormonal changes and mood in the puerperium. *The British Journal of Psychiatry.* 1976;128:379-383.	No information available for OR
64	de Morais EA, Marini FC, Cabral ACV. Association between emotional symptoms of premenstrual syndrome and the risk of developing depressive symptoms in the postpartum period. *Rev Med Minas Gerais.* 2013;23(3):273-275.	PPD measured within the first week postpartum
65	Hu MC, Gong LQ, Li DY. Investigation of relevant factors for postpartum depression. *Chinese Journal of Practical Nervous Diseases.* 2009;12(4):34-35.	PPD measured within the first week postpartum
66	李清秀, 何志晖. 产后抑郁症相关因素分析及预防策略. *中国医师杂志.* 2010(z1):258-259.	PPD measured within the first week postpartum
67	钟巧莹, 何志晖, 蓝文莉. 产后抑郁症相关因素及预防策略. *中国实用医药.* 2008;3(14):168-169.	PPD measured within the first week postpartum
68	Bloch M, Rotenberg N, Koren D, Klein E. Risk factors for early postpartum depressive symptoms. *General Hospital Psychiatry.* 2006;28(1):3-8.	PPD measured within the first week postpartum
69	毛红芳, 荣荷花, 王子文, et al. 上海市嘉定区孕产妇心理健康状况和保健需求变化调查. *中国妇幼保健.* 2017;32(12):2729-2734.	PPD measured within the first week postpartum
70	王天成, 赵建兰, 王斌. 产后抑郁症的相关问题分析. *中华妇幼临床医学杂志(电子版).* 2008;4(5):32-34.	PPD measured within the first week postpartum
71	毛红芳, 荣荷花, 王子文, et al. 嘉定区孕产妇焦虑抑郁现况调查与相关因素研究. *中国妇幼保健.* 2014(18):2948-2951.	PPD measured within the first week postpartum
72	Dennis CL, Janssen PA, Singer J. Identifying women at-risk for postpartum depression in the immediate postpartum period. *Acta psychiatrica Scandinavica*. 2004;110(5):338-346.	PPD measured within the first week postpartum

73	Algul A, Semiz UB, Dundar O, et al. Psychosocial and Hormone Related Risk Factors for Early Postnatal Depressive Symptoms in Turkish Women. *Neurology Psychiatry and Brain Research.* 2008;15(3):117-122.	Only abstract available, no full-text
74	Okano T, Minamida T, Kokubu M. A follow-up study for relationship between PMDD and postnatal depression. *Archives of Women's Mental Health.* 2011;14(Suppl.1):S76-S77.	Only abstract available, no full-text
75	Rabenda-Lacka KM. The prevalence and risk factors of postpartum depression in Poland. *Archives of Women's Mental Health.* 2011;14(Suppl.1):S44.	Only abstract available, no full-text
76	Aydin N, Omay O. Perinatal mental health in Turkey. *Archives of Women's Mental Health.* 2013;16(Suppl.1):S84.	Only abstract available, no full-text
77	Dias R, Castro G, Salvini R, et al. Bipolar disorder and premenstrual disphoric disorder comorbidity: Apriori algorithm study. *Bipolar Disorders.* 2018;20(Suppl.1):89.	Only abstract available, no full-text
78	Jones L, Gordon-Smith K, Perry A, et al. Illness episodes in relation to reproductive cycle events in women with bipolar disorder: Data from the bipolar disorder research network. *Bipolar Disorders.* 2018;20(Suppl.1):96.	Only abstract available, no full-text
79	Eros E. Premenstrual syndrome as a possible presymtomatic marker for negative outcomes of pregnancy. *European Journal of Contraception and Reproductive Health Care.* 2018;23(Suppl.1):126-127.	Only abstract available, no full-text
80	Ju DH, Yi SW, Lee SS, Sohn WS, Kim I, Kim E. Correlation between postpartum depression and premenstrual syndrome in Korean women. *International Journal of Gynecology and Obstetrics.* 2012;119(Suppl.3):S602.	Only abstract available, no full-text
81	Buttner MM, Stuart S, O'Hara MW. Moving beyond the EPDS: The association between postpartum depressive symptoms and premenstrual dysphoric disorder. *Archives of Women's Mental Health.* 2011;14(Suppl.1):S62.	Only abstract available, no full-text
82	Lanczik M, Brockington IF. Postpartum blues syndrome: Psychopathology, diagnostics and aetiology. *Fortschritte der Neurologie Psychiatrie.* 1999;67(2):60-67.	Non-English and non-Chinese

83	Vega-Dienstmaier JM, Mazzotti G, Stucchi-Portocarrero S, Campos M. Prevalence and risk factors for depression in postpartum women. *Actas Esp Psiquiatr.* 1999;27(5):299-303.	Non-English and non-Chinese
84	Kamranpour SB, Shakiba M. Cesarean section and post partum depression. *Iranian Journal of Obstetrics, Gynecology and Infertility.* 2012;15(1):60-67.	Non-English and non-Chinese
85	Gümüş AB, Keskin G, Alp N, Özyar S, Karsak A. Postpartum depresyon yaygınlığı ve ilişkili değişkenler. [The prevalence of postpartum depression and associated variables.]. *Yeni Symposium: psikiyatri, nöroloji ve davraniş bilimleri dergisi.* 2012;50(3):145-154.	Non-English and non-Chinese
86	Gümüfl AB, Keskin G, Alp N, Özyar S, Karsak A. The prevalence of postpartum depression and associated variables. *Yeni Symposium.* 2012;50(3):145-154.	Non-English and non-Chinese
87	Sylvén SM, Thomopoulos TP, Kollia N, Jonsson M, Skalkidou A. Correlates of postpartum depression in first time mothers without previous psychiatric contact. *European Psychiatry.* 2017;40:4-12.	Duplicated data of another study included in the meta-analysis

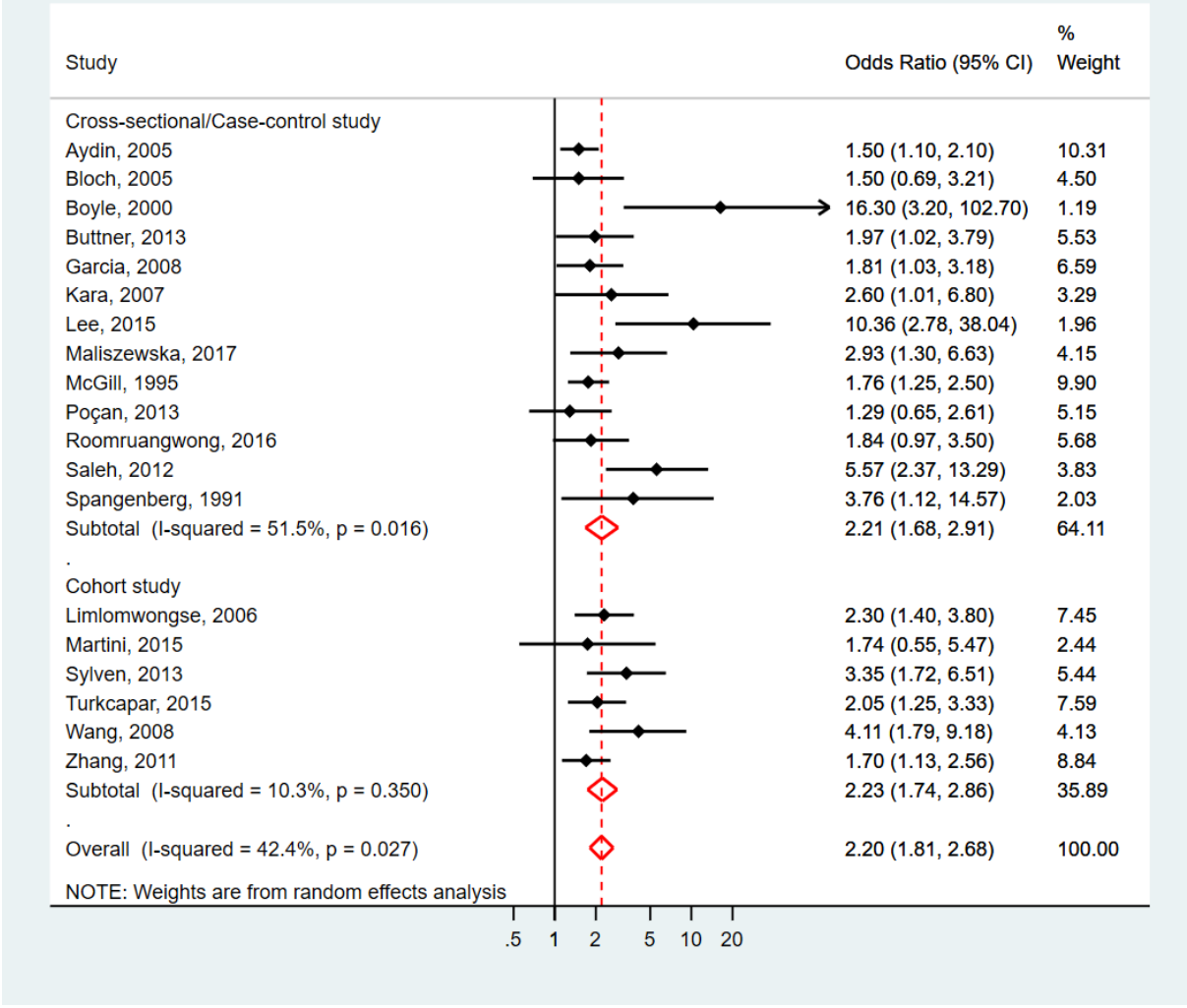

Figure S1. Forest plot for the association between PMS and PPD, stratified by the study design (cross-sectional/case-control vs cohort study).

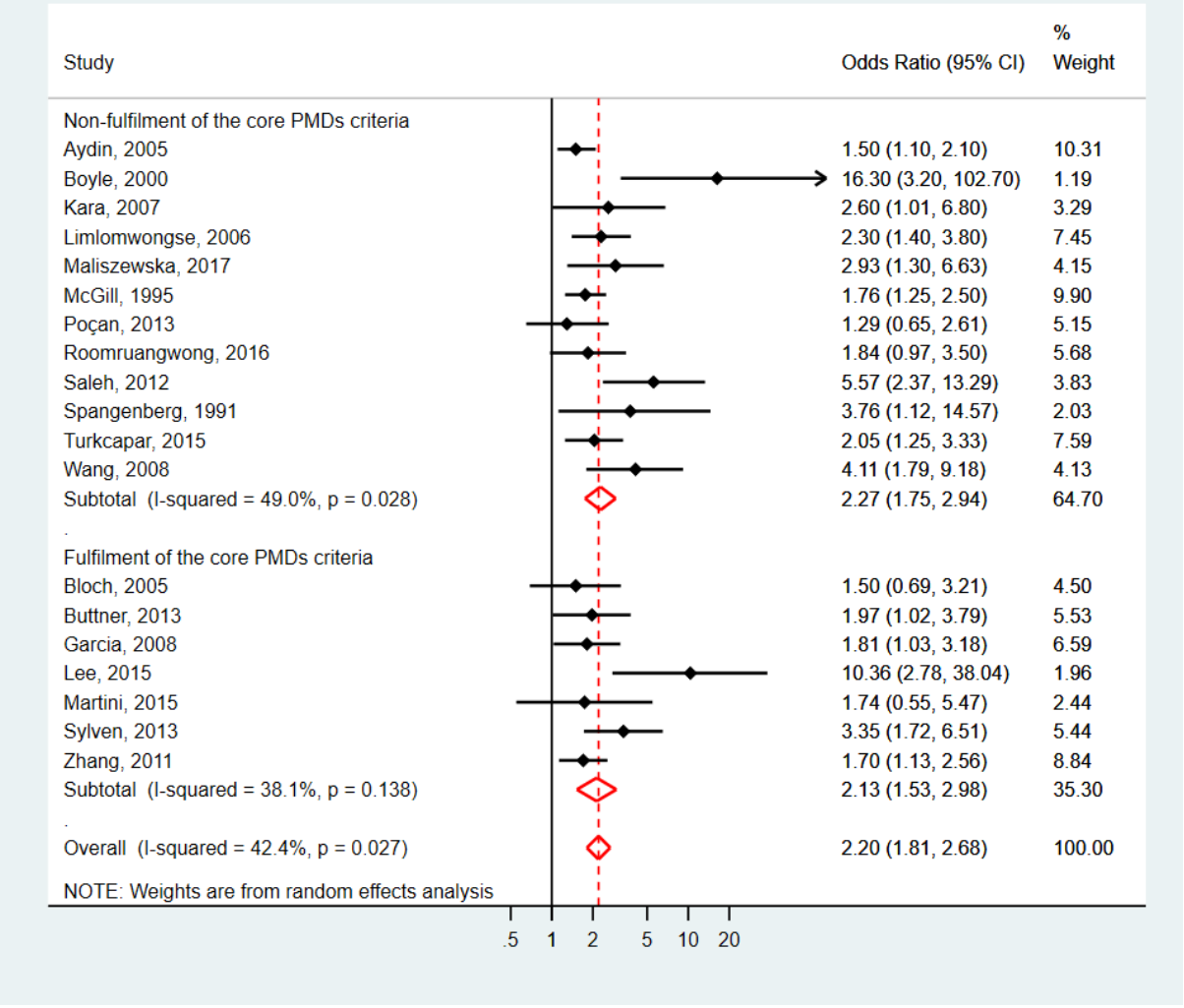

Figure S2. Forest plot for the association between PMS and PPD, stratified by the definition of PMS (non-fulfilment of the core PMDs criteria vs fulfilment of the core PMDs criteria). Studies that defined symptoms affecting daily functioning as PMS were grouped into core PMDs subgroup, as meeting the criteria for core PMDs recommended by both the ISPMD consensus and the RCOG guideline, while the remaining studies not fulfilling the criteria of core PMDs were grouped into the other subgroup.

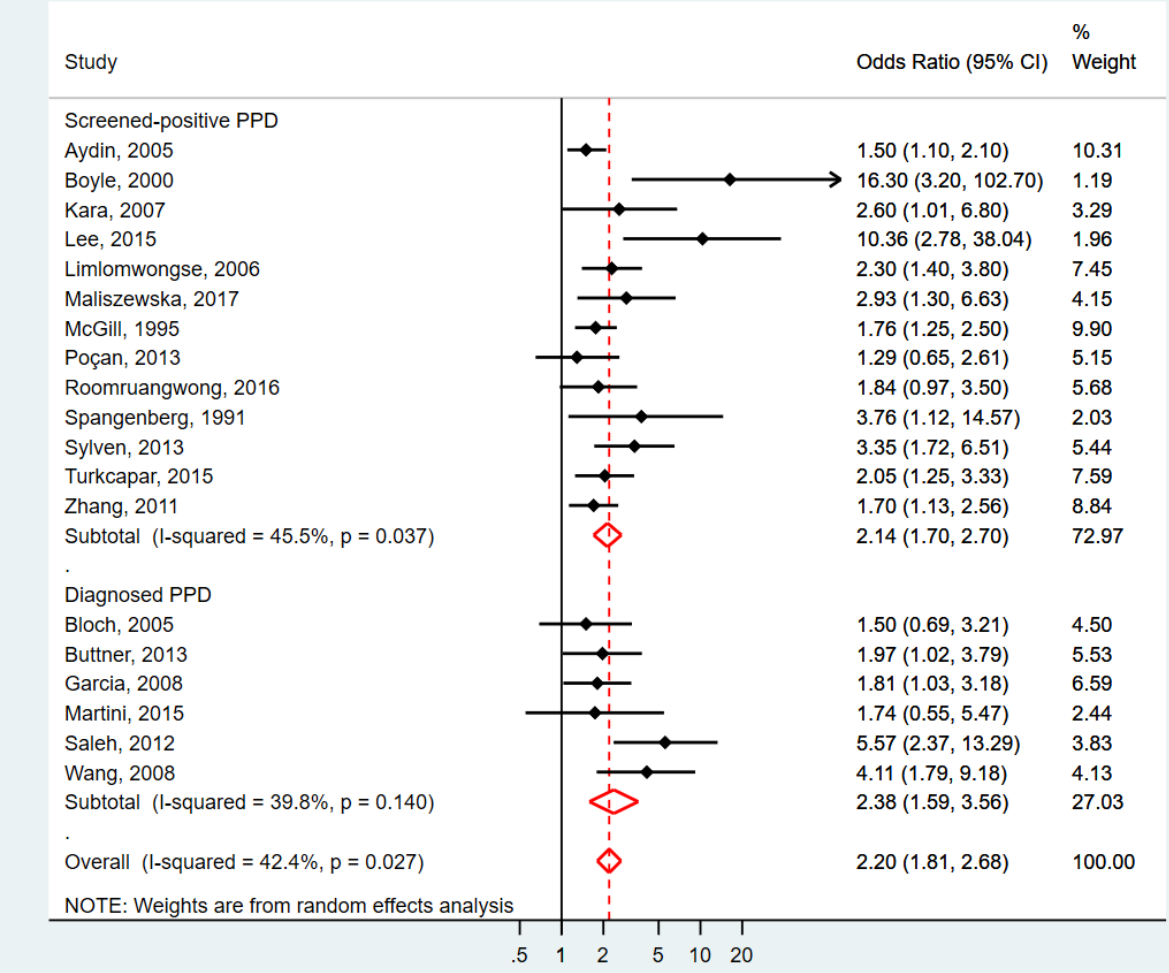

Figure S3. Forest plot for the association between PMS and PPD, stratified by the assessment approach of PPD (screening vs diagnosis). Studies that used screening scale determining PPD were grouped into the screening subgroup, while studies that used clinical diagnoses identifying PPD were grouped into the diagnosis subgroup.

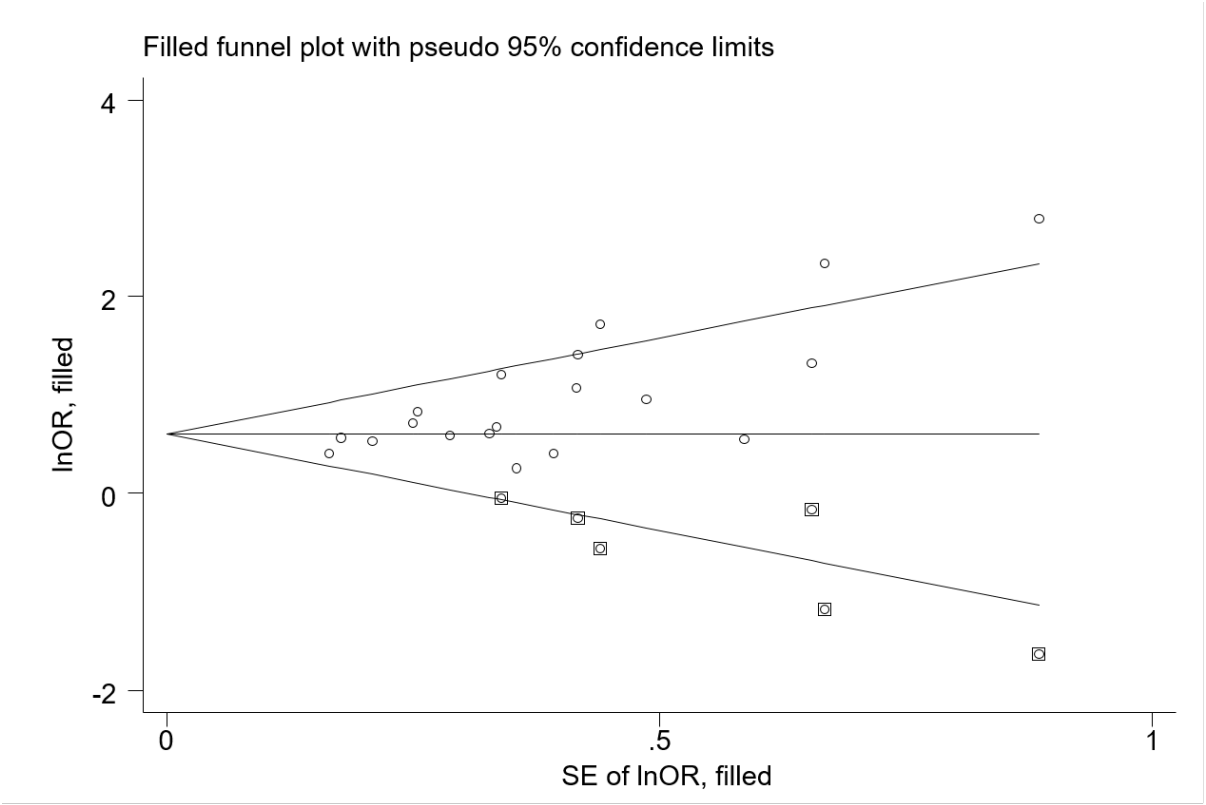

Figure S4. Trim-and-fill funnel plot. A funnel-plot-based method produced a new estimate of the association containing imputed etimates from unpublished studies (OR=1.83, 95% CI: 1.45-2.30).

Highlights

- PMS may be a risk factor for postpartum depression, but with mixed findings to date
- This study synthesised evidence from papers published in English and Chinese
- From meta-analysis a positive association between the two conditions was identified
- Women with a history of PMS had double the odds of developing postpartum depression
- Good-quality prospective studies are needed to confirm this finding

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To: Sifan Cao
Subject: Invitation to revise manuscript JPSYCHIATRRES_2019_742

Ref: JPSYCHIATRRES_2019_742
Title: History of premenstrual syndrome and development of postpartum depression: a systematic review and meta-analysis
Journal: Journal of Psychiatric Research

Dear Ms. Cao,

Thank you for submitting your manuscript to Journal of Psychiatric Research. Reviewers have now commented on your paper. You will see they are advising a revision of your manuscript. Specifically, Reviewer 1 points to a recently published review in Biological Psychology to the same topic, but different analytical approach. The revision needs to refer to this review, and the additional information over the recently published paper needs to be clearly pointed out.

Although I am sorry to say that we cannot publish your manuscript in its present form, I would be pleased to reconsider should you be prepared to undertake the work required for revision.

For your guidance, reviewers' comments are appended below.

If you decide to revise your work, please submit the list of changes or rebuttals for each of the raised points when you submit the revised manuscript.

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I look forward to receiving your revised manuscript as soon as possible.

Yours sincerely,

Florian Holsboer
Co-Editor-in-Chief
German Editorial Office
Journal of Psychiatric Research

Comments from the reviewers:

-Reviewer 1

- This review does not add significantly relevant information to the already published literature such as the review of Amiel Castro et al 2018.

-Reviewer 2

- A clear, complete analysis and review on an important topic.

-Reviewer 3

- This manuscript is investigating the potential association between premenstrual mood symptoms (PMS) and the later development of postpartum depression (PPD). The authors performed a systematic review and meta-analysis and concluded that retrospectively reported history of PMS was associated with a higher chance of developing PPD in the year following childbirth. Issues with the manuscript that should be addressed include: 1) Although generally well written it should be read for grammar and readability. There are a number of areas where the authors intention is not clear. For example in the discussion: "Despite all relevant evidence was synthesized in the present study, various potential biases were found in the original studies." Perhaps this should read: Despite the fact that all relevant evidence was synthesized in the present study, there were a number of potential biases in the original studies. 2) There is an abrupt transition in the Discussion section. The paragraph begins with a discussion surrounding hormones and then the next sentence is "However, eight studies ...." and goes on the described studies that were excluded. I would read the discussion carefully and make sure it flows smoothly and in a logical fashion. 3) The authors would do well to distinguish more clearly PMS from PMDD and define both and to make it clear what definition(s) were used. In the Study Selection and Eligibility Criteria section the authors state "PMS was defined as premenstrual symptoms that occur repeatedly in the late luteal phase, including all types of physical and or psychological changes and PMDD." Does that mean that studies which included PMDD were included? Where there studies with just physical changes? It's really not clear. The differences between the various definitions used in the included studies should also be made clear- possibly in the intro. Simply saying the ICD-10 definition was used does not give the reader context. Compare and contrast them. 4) Finally, one of the biggest weaknesses is the extremely variable amount of time allowed for the definition of PPD- up to one year postpartum. This is problematic as the premise of the paper is that there may be a vulnerability to times of hormonal change in women with PMS and PPD. It is doubtful that the onset of a depressive episode 6 months or 12 months after delivery would be triggered by the hormonal changes associated with delivery. That being said, the authors cannot correct this weakness but it should be discussed in the limitations section.

Oct 29, 2019

Prof. Florian Holsboer
Co-Editor-in-Chief
Journal of Psychiatric Research

Dear Professor Holsboer,

Thank you for the opportunity to revise our paper entitled **History of premenstrual syndrome and development of postpartum depression: a systematic review and meta-analysis (JPSYCHIATRRES_2019_742).** In response to the comments from the editorial board and the reviewers, we have revised our manuscript and highlighted the changes we made. Please find below a point-by-point response to all comments.

We hope the revised manuscript is now suitable for publication, and we look forward to hearing from you.

Yours sincerely,

Sifan Cao
Corresponding author, on behalf of all co-authors

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Email: sifan.cao@uq.edu.au

Editorial board

"Thank you for submitting your manuscript to Journal of Psychiatric Research. Reviewers have now commented on your paper. You will see they are advising a revision of your manuscript. Specifically, Reviewer 1 points to a recently published review in Biological Psychology to the same topic, but different analytical approach. The revision needs to refer to this review, and the additional information over the recently published paper needs to be clearly pointed out.

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For your guidance, reviewers' comments are appended below.

If you decide to revise your work, please submit the list of changes or rebuttals for each of the raised points when you submit the revised manuscript."

Response: Thank you for your suggestions. We have undertaken a careful revision of the paper according to the comments received. Briefly, we made the following changes specifically.

- The information this paper adds over the recent review with a similar topic has been addressed in our response to Reviewer 1's comments and has been fully elaborated in the revised manuscript.
- The Introduction has been rewritten to incorporate the comparison and contrast of the various definitions of PMS (paragraph 4).
- The eligibility criteria for study inclusion have been reworded for clarity.
- The symptoms and severity that each original study specified to fulfil the definition of PMS have been summarised in the Results ("Study characteristics") and listed in Table 1 (columns "Symptoms" and "Interferes with daily life"). The timing of PPD detection has been indicated as well ("Study characteristics").
- The variable timing of PPD detection in the original studies and the unknown mechanism for the association between history of PMS and PPD occurrence in late postpartum period have now been discussed in "Strengths and limitations" and "Interpretation", respectively.
- The full manuscript has been reorganised to improve the logical flow of information and readability.

Reviewer 1

"This review does not add significantly relevant information to the already published literature such as the review of Amiel Castro et al 2018."

Response: Thank you for raising this point. We have now highlighted the additional information presented in this review compared to the Amiel Castro et al.'s on a similar topic. Differences between the two reviews, in terms of the study design, analytical approach, selection criteria, results and implication have now been fully elaborated throughout the

paper. Please refer to the **Introduction** (line 57-97), the **Method** (line 109-127, line 132-141, line 142-160), the **Results** (line 173-247), and the **Discussion** (line 249-268, line 286-299, and line 334-377). Overall, our review is different from the paper of Amiel Castro et al. in the following aspects.

- First, this review explicitly synthesised studies that investigated the temporal association between a history of PMS before pregnancy and PPD development. In contrast, Amiel Castro et al. did not independently consider the temporal association between PMS and PPD as they included studies that examined the comorbidity between PMS and PPD and those looking at how PPD might affect PMS.
- Second, Amiel Castro et al. have not conducted a meta-analysis to estimate the magnitude of the association between PMS and PPD reported in the literature.
- Third, our review carefully examined the bias of the original studies from seven domains (e.g. confounding, selection of participants, classification of exposure, measurement of outcome, missing data, etc.) and highlighted the issues that future studies should take account when confirming whether having a history of PMS increases women's risk of PPD.
- Fourth, studies excluded from this review (as compared to Amiel Castro et al.) and the reasons for exclusion are summarised under the "Comparison with previous literature" subheading in the Discussion section.

Reviewer 2

"A clear, complete analysis and review on an important topic."

Response: Thank you.

Review 3

"This manuscript is investigating the potential association between premenstrual mood symptoms (PMS) and the later development of postpartum depression (PPD). The authors performed a systematic review and meta-analysis and concluded that retrospectively reported history of PMS was associated with a higher chance of developing PPD in the year following childbirth. Issues with the manuscript that should be addressed include:

1) Although generally well written it should be read for grammar and readability. There are a number of areas where the authors intention is not clear. For example in the discussion: "Despite all relevant evidence was synthesized in the present study, various potential biases were found in the original studies." Perhaps this should read: Despite the fact that all relevant evidence was synthesized in the present study, there were a number of potential biases in the original studies."

Response: This sentence has been revised accordingly (line 335, 336), and the paper has now been rechecked and where necessary reworded for better clarity and readability.

"2) There is an abrupt transition in the Discussion section. The paragraph begins with a discussion surrounding hormones and then the next sentence is "However, eight studies....." and goes on the described studies that were excluded. I would read the discussion carefully and make sure it flows smoothly and in a logical fashion."

Response: This paragraph has now been reorganized – the comparison of our review with the study of Amiel Castro et al. has been put in a separate paragraph with the subheading "Comparison with previous literature" (line 258-268) and the discussion surrounding hormones has been moved down to the subheading "Interpretation" (line 269-285) as a biological explanation for the findings of the present study.

"3) The authors would do well to distinguish more clearly PMS from PMDD and define both and to make it clear what definition(s) were used. In the Study Selection and Eligibility Criteria section the authors state "PMS was defined as premenstrual symptoms that occur repeatedly in the late luteal phase, including all types of physical and or psychological changes and PMDD." Does that mean that studies which included PMDD were included? Where there studies with just physical changes? It's really not clear. The differences between the various definitions used in the included studies should also be made clear- possibly in the intro. Simply saying the ICD-10 definition was used does not give the reader context. Compare and contrast them."

Response: We have revised the manuscript accordingly, details as below.

- The PMS definition used has been reworded for clarity in the "Study selection and eligibility criteria" (line 120, 121) and complies with the ICD-10 definition. That is, any premenstrual symptoms that occur repeatedly in the premenstrual period (late luteal phase), regardless of whether the symptoms were physical, psychological or both, were classified as PMS. This also included the severe form of PMS – PMDD as defined by the DSM-IV definition.
- We agree with the reviewer's point that the definition used in the original studies should be clearly indicated and distinguished from each other; hence, this information is now provided in Table 1 (highlighted in yellow). To be specific, the column "PMS assessment" has been changed into "PMS definition", and the "criteria" (ICD-10, ACOG, DSM-IV, etc.) has been removed and "symptoms", which refers to the type of symptoms that were used to define PMS in the original studies were instead included in the table. Since none of the included studies required merely physical symptoms to define PMS, there is no study labelled with "physical" in this column. Studies that explicitly used PMDD as the exposure were additionally indicated in the "symptoms" column. In addition, the previous "Core PMDs" column has been changed into "Interferes with daily life", which refers to the severity of the symptoms. The description of the original definitions of PMS has also been added to "Study characteristics" in the Results section (line 189-202).
- The commonly used definitions of PMS have now been compared and contrasted in the Introduction (line 69-90), from the disparities in symptoms required to the influences on women's daily lives, with the corresponding prevalence also provided.

- Since we adopted the criteria "core premenstrual disorders (PMDs)" as the gold standard to classify PMS, and both the ACOG definition of PMS and the DSM-IV definition of PMDD met these criteria, we did not distinguish definitions of PMS from one another in the analysis. Instead, we stratified studies into two groups by whether the original definition of PMS in each study met the core PMDs criteria or not, which required PMS to cause significant impairment on women's daily lives to distinguish PMS from physiological premenstrual symptoms, and a subgroup analysis was performed based on this (Figure S2).

"4) Finally, one of the biggest weaknesses is the extremely variable amount of time allowed for the definition of PPD- up to one year postpartum. This is problematic as the premise of the paper is that there may be a vulnerability to times of hormonal change in women with PMS and PPD. It is doubtful that the onset of a depressive episode 6 months or 12 months after delivery would be triggered by the hormonal changes associated with delivery. That being said, the authors cannot correct this weakness but it should be discussed in the limitations section."

Response: The timing for PPD detection in the original studies has now been described in "Study characteristics" (line 181-188). The issue of using the one-year time frame to define PPD has now been discussed in the "Strengths and limitations" sub-section (line 319-333). We also agree that the hormonal fluctuation theory may not explain the association observed in women who developed PPD in the late postpartum period, and this is now discussed in the "Interpretation" section (line 280-285). It is worth noting that although the postpartum time frame of PPD defined in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition is 4 weeks after delivery [1], researchers have long appealed for the extension to six months or even further [2,3] and it has been recommended to use longer periods to define PPD for prevention studies [4]. This systematic review of the most recent literature aimed to assess whether history of PMS is a potential predictor for PPD that could help inform new strategies for PPD prevention. We thus adopted the one-year postpartum period to define PPD as it is widely used in both clinical practice and research settings [4-7].

References

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4. O'Hara MW, McCabe JE. Postpartum Depression: Current Status and Future Directions. *Ann Rev Clin Psych.* 2013;9(1):379-407.
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7. O'Hara MW, Wisner KL. Perinatal mental illness: definition, description and aetiology. *Best Pract Res Clin Obstet Gynaecol.* 2014;28(1):3-12.

Sifan Cao

From: Anna-Maria Proebstl (Journal of Psychiatric Research) <EviseSupport@elsevier.com>

Sent: Saturday, 16 November 2019 4:47 PM
To: Sifan Cao
Subject: Your manuscript JPSYCHIATRRES_2019_742_R1 has been accepted

Ref: JPSYCHIATRRES_2019_742_R1
Title: History of premenstrual syndrome and development of postpartum depression: a systematic review and meta-analysis
Journal: Journal of Psychiatric Research

Dear Ms. Cao,

I am pleased to inform you that your paper has been accepted for publication. Your accepted manuscript will now be transferred to our production department and work will begin on creation of the proof. If we need any additional information to create the proof, we will let you know. If not, you will be contacted again in the next few days with a request to approve the proof and to complete a number of online forms that are required for publication.

Comments from the reviewers can be found below.

Thank you for submitting your work to Journal of Psychiatric Research. We hope you consider us again for future submissions.

Yours sincerely,

Florian Holsboer
Co-Editor-in-Chief
German Editorial Office
Journal of Psychiatric Research

Comments from the reviewers:

-Reviewer 1

- None

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